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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/937,027	09/19/2001	Bernhard Raaf	112740-283	3093

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EXAMINER	
MERED, HABTE	

ART UNIT	PAPER NUMBER
2662	

DATE MAILED: 10/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/937,027	RAAF ET AL.	
	Examiner	Art Unit	
	Habte Mered	2662	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10,11,and 18* is/are rejected.

7)☒ Claim(s) *12-17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 September 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/19/2001*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-9 cancelled by Applicant and substituted with claims 10-18 as stated in the preliminary amendment filed on 19 September 2001.

2. Claims 10-18 are examined.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 10, 11, and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Eroz et al (US 6, 370, 669), hereinafter referred to as Eroz, in view of Lee et al (US 6, 289, 486), hereinafter referred to as Lee.

Eroz discloses a method and apparatus for Turbo encoding uses a set of rate-compatible Turbo codes optimized at high code rates. The Turbo codes have rate-compatible puncturing patterns.

5. Eroz discloses a method and apparatus for data rate matching, the method comprising the steps of distributing data to be transmitted in the form of bits via a first interleaver to a set of K frames **(See Figure 1, elements 204, 208, and 212 and Column 5, Lines 52-67)**; carrying out a puncturing or repetition method for data rate matching after interleaving **(See in Figure 3 puncturing occurring after interleaving and also refer to Column 7, Lines 1-5)**; and varying a distance between punctured or repeated bits with regard to the sequence of the bits before the first interleaver, for

puncturing or repeating the same number of bits in each frame **(Column 7, Lines 15-35)**, with the separation being defined by the following relationship:

$q-1 \leq \text{distance} \leq q + \text{lcd}(q,K) + 1$, where $q := (\lfloor N_c/(|N_i-N_c|) \rfloor) \bmod K$, where $\lfloor \rfloor$ refers to rounding down and | | refers to absolute value, and where N_i := the number of bits after rate matching, N_c := the number of bits before rate matching; and lcd(q, K) := highest common denominator of q and K.

Eroz fails to disclose the distance between punctured bits can be defined by the following relationship:

$q-1 \leq \text{distance} \leq q + \text{lcd}(q,K) + 1$, where $q := (\lfloor N_c/(|N_i-N_c|) \rfloor) \bmod K$, where $\lfloor \rfloor$ refers to rounding down and | | refers to absolute value, and where N_i := the number of bits after rate matching, N_c := the number of bits before rate matching; and lcd(q, K) := highest common denominator of q and K.

Lee teaches an adaptive channel encoder.

Lee discloses the distance between punctured bits can be defined by the following relationship:

$q-1 \leq \text{distance} \leq q + \text{lcd}(q,K) + 1$, where $q := (\lfloor N_c/(|N_i-N_c|) \rfloor) \bmod K$, where $\lfloor \rfloor$ refers to rounding down and | | refers to absolute value, and where N_i := the number of bits after rate matching, N_c := the number of bits before rate matching; and lcd(q, K) := highest common denominator of q and K. **(Lee discloses an interleaving operation based on the greatest common factor of the columns and rows (M,N) and the mathematical relation show by the Applicant can be deduced from equation 1 shown in Column 6 and from the mathematical steps shown in Figures 9-11. Also**

See Equations 2-5 that exhibit similar relationship to that of the mathematical relationship shown by the Applicant.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Eroz's apparatus to incorporate a special mathematical relationship that determines the distance between the punctured bits. The motivation is that Eroz in Column 7, Lines 16-19 indicates varying the distance between the punctured bits determine the rate of the Turbo codes and Lee provides the relationship that determines the distance between the punctured bits, and as a further motivation it ensures that the extra coding gained by Turbo Codes is realized.

6. Regarding **claim 11**, Eroz teaches all aspects of the claimed invention as set forth in the rejection of claim 10 but fails to teach a method for data rate matching, wherein the following relationship is also valid when the puncturing rate or the repetition rate is equal to 1/K:

$q-1 \leq$ distance $\leq q + \text{lcd}(q,K) + 1$, where $q := (\lfloor N_c/(IN_i-N_cI) \rfloor) \bmod K$, where $\lfloor \rfloor$ refers to rounding down and I I refers to absolute value, and where $N_i :=$ the number of bits after rate matching, $N_c :=$ the number of bits before rate matching; and lcd(q, K) := highest common denominator of q and K.

Lee discloses a method for data rate matching, wherein the following relationship is also valid when the puncturing rate or the repetition rate is equal to 1/K:

$q-1 \leq$ distance $\leq q + \text{lcd}(q,K) + 1$, where $q := (\lfloor N_c/(IN_i-N_cI) \rfloor) \bmod K$, where $\lfloor \rfloor$ refers to rounding down and I I refers to absolute value, and where $N_i :=$ the number of bits after rate matching, $N_c :=$ the number of bits before rate matching; and lcd(q, K) :=

highest common denominator of q and K. **(Lee discloses an interleaving operation based on the greatest common factor of the columns and rows (M,N) and the mathematical relation show by the Applicant can be deduced from equation 1 shown in Column 6 and from the mathematical steps shown in Figures 9-11. Also See Equations 2-5 that exhibit similar relationship to that of the mathematical relationship shown by the Applicant. In Figure 9 Eroz shows for any rate the distance is still determined by the relationship shown in equation 2.)**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Eroz's apparatus to incorporate a special mathematical relationship that determines the distance between the punctured bits. The motivation is that Eroz in Column 7, Lines 16-19 indicates varying the distance between the punctured bits determine the rate of the Turbo codes and Lee provides the relationship that determines the distance between the punctured bits, and as a further motivation it ensures that the extra coding gained by Turbo Codes is realized.

Allowable Subject Matter

7. **Claims 12-17** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Regarding **claim 12**, the cited references taken individually or in combination fail to particularly disclose varying the distance to q- 1 or q+1 between adjacent punctured or repeated bits, if the number of punctured or repeated bits in a frame would exceed the number of punctured or repeated bits in another frame by more than one, and if the

puncturing or repetition were carried out with a distance with regard to the sequence of the bits before the first interleaver between adjacent punctured or repeated bits of magnitude q; and continuing with the step of puncturing if any further bits need to be punctured or repeated.

9. Regarding **claim 13**, the cited references taken individually or in combination fail to particularly disclose a method wherein a puncturing or repetition process is carried out in such a manner that the puncturing or repetition pattern used within a frame is also shifted and used within further frames in the set of frames.

10. Regarding **claim 16**, the cited references taken individually or in combination fail to particularly disclose a method for data rate matching, wherein bits, which are to be punctured or to be repeated, are produced via a method, which comprises the steps of: determining the integer component q of the mean puncturing distance using using $q := (\lfloor N_c/(|N_i - N_c|) \rfloor)$ where $\lfloor \rfloor$ refers to rounding down and | | refers to absolute value, and in which case:

N_i := the number of bits after rate matching,

N_c := the number of bits before rate matching;

selecting a bit to be punctured or to be repeated in a first column; selecting the next bit to be punctured or to be repeated in the next frame, starting from the last bit to be punctured or to be repeated in the previous frame by selecting the next bit at the distance q, with respect to the original sequence, starting with this last bit to be punctured or to be repeated, providing this does not lead to a frame being punctured or repeated twice, or else by selecting a bit with a distance which has been changed from

q to q-1 or q+1 for puncturing or repetition; and repeating the step of selecting the next bit until all columns have been punctured or repeated once.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following also disclose similar subject matter:

US Patent (6, 622, 2810) to Yun et al

US Patent (6, 543, 013) to Li et al

International Pub. (WO 99/23798) to Ramesh

Correspondence

12 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Habte Mered whose telephone number is 571 272 6046. The examiner can normally be reached on Monday to Friday 9:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571 272 3088. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HM
09-30-2005

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